MPL Overlap Correction Calibration (CALC)

I. Purpose:

The purpose of this procedure is to characterize the overlap of the detection and receiving optics of the original Low Resolution MPL after installation at a site. The data file produced during this procedure is used to calibrate the near-range MPL behavior. The near-range behavior is very sensitive to the alignment of both the detection and receiving optics. The precise nature of this behavior may vary from instrument to instrument, and may change following transport of the instrument. It can be affected by either mechanical or thermal shock and may change subtly over time. Therefore, this procedure will need to be performed after installation at a site. It should be repeated following the replacement or realignment of any optical elements, or once per year in any event.

II. Cautions and Hazards:

- This procedure is to be performed only by RESET team personnel who have successfully completed a laser safety course.

- Care must be taken to protect the MPL transmitter/receiver assembly from mechanical shock.

- In addition, the optical fiber and electrical cables must not be kinked or subjected to strain or stress.

III. Requirements:

- The lidar needs to be positioned so that the laser beacon is within a few degrees of horizontal.

- The beam must be unobstructed for at least 10 km. Obstructions include buildings, trees, mountains, and low clouds.

- If possible, this measurement should be carried out at night.

- 7/16 inch wrench.

- A labjack with a cushion or pad of foam.

- Allen wrench, 9/64 inch (for high resolution HR).

IV. Procedure:

A. Steps:

1. Notify data system of calibration.

2. Note the time that the procedure begins for later reference.

3. If the MPL data acquisition program is currently collecting data, press "Q" to terminate the current data set; after the current collection interval is over, close the current file; the prompt shows "take data, play data, or exit"; choose "X" to exit.

4. The transmitter/receiver box is fastened to the top of the 19" instrument rack with braces that are fastened by screws into 7/16" nuts on the inside of the rack; loosen the braces, allowing the MPL telescope to be repositioned.

   Note: The pinhole for the MPL at Manus is very loosely mounted; use **extreme care** when moving the system outside.

5. Power down the laser, then turn OFF.

6. Power OFF the computer and other modules.

7. Remove communication, power, fiber optic (carefully) and other electrical control cables.

8. Gently remove MPL transceiver and place in a safe, temporary location.

9. Reassemble system outside within reach of the main system power card.

10. Place the MPL Transceiver on its side and brace with a labjack. (The system should be as horizontal as possible without pointing at structures like the site fence.)

11. Reattach cable and reassemble the system.

12. Create a directory called "Tempmpl."

13. Move all data in the data and output directories to the "data" and "output" directories in "Tempmpl."

14. Run MPL_READ.EXE from the OVERLAP directory. When presented with the prompt "Enter your command ------ >", type "R" and hit "Enter." Enter ten (10) seconds as the averaging time and 2500 as the laser pulse rate.   The computer will begin collecting data.

15. From the top plot on the computer screen (showing backscatter intensity on the vertical axis and altitude on the horizontal axis); verify that no obstructions are within at least ten (10) kilometers.

16. If the backscatter plot indicates an obstruction, adjust the level and orientation of the telescope keeping the transmitted beam as close to

horizontal as possible until no obstruction is evident. Once this condition is met, hit "Q" to quit taking data.

17. Delete all files from the OUTPUT and DATA directories.

18. Run MPI.EXE program again, but this time select "T" to take data with the default settings.

19. Take data for as long as possible, hopefully for at least an hour and a half, and preferably at night.

20. When enough data are accumulated (operators discretion), reposition the transceiver to hit a hard target no more than a kilometer away and at least 100m.

21. Take data for one (1) more hour for after pulsing analysis.

22. Place the lid on the MPL and take data for ten minutes.

23. Power down the laser (do not turn OFF), take the lid off, and take data for another ten minutes.

24. Finally replace the lid and take data ten minutes with the laser powered down for.

25. Copy the data from the OUTPUT and DATA directories to floppy disks or a Zip disk if available; deliver this to the instrument mentor.

26. Delete the overlap data files from the OUTPUT and DATA directories and move the old data and output files in "Tempmpl" back into the OUTPUT and DATA directories.

27. Reposition the MPL transmitter/receiver back under the viewport window

28. With a piece of paper, verify that the laser beacon is bright and uniform and that the shape is still circular.

29. Run the MPL.EXE program inside the MPL directory; wait at least two minutes and verify proper operation of the instrument.

30. Once the environment of the van is stable, turn the humidity interlock back ON.

31. Notify the data system that the calibration is completed and the system is operational.

B.   MPL HR Overlap Test Procedure

1. Click on the RED "stop" icon on the right column bar to END win/MPL program.

2. Click on END MPL; next START; SHUTDOWN as winNT as usual.

3. If need to move entire MPL, TURN EVERYTHING **OFF** FIRST:

- Computer:

    a) With handset, press mode (blank) button until WATTS is shown; press arrow DOWN until 0.00.

    b) Use key switch to turn OFF laser.

- Use rocker to turn OFF MPL SCALAR.

- Turn OFF illuminated rocker on main strip (at lease two people are necessary to disconnect Ethernet cable, power, mouse, and laser; carefully place telescope on rack and carry outside.

After Setting Up Outside

4. Turn ON in reverse order as turned OFF; click OK for service (wait one (1) minute before turning on laser power supply.

To Change Setting

5. Click on first button (cloud w/ black border) on right of sever with mouse (sampling-take data without saving).

6. Click on End icon.

7. Click on Signal Scale (UP arrow to shrink down).

8. Click on file, then system setup; get configuration window.

9. Click on File, then System Setup; get configuration window.

10. Change averaging time to five (5) seconds; click OK or enter.

11. Observe first screen and aim until no spikes are observed and angle is as close as possible to horizontal.

12. Click END.

13. Change acquisition time to one (1) min. by clicking on System Setup under File.

14. Click File, open for playback, go to parent directory (WMPL).

15. Click on Overlap folder.

16. With no files selected, click on OPEN.

17. Click on "X" box to close.

18. Click on cloud with blue border (sample and save).

19. Take data for at least one (1) hour.

Shut Down

20. Click on END icon.

Hard Target Test

21. Go to System Setup under File and reset to five (5) seconds (fast).

22. Click File, open file for playback, click on black cloud (do not save data).

23. Aim at close-in object after acquiring.

24. Repeat steps 7-13 above.

25. Put file in HARD TARGET file and sample.

Lid ON, Laser ON Test

26. Put lid ON laser.

27. Put file in Lid ON Laser ON and sample (steps 7-13).

28. Take data for two (2) minutes; end as in step 19.

Lid ON, Laser OFF Test

29. Power DOWN laser with handset to 0.00.

30. Put file in Lid ON Laser OFF and sample.

31. Take data for two (2) minutes; END.

32. Press "Cntrl Esc"; use "Windows Explorer" to copy files to disk.

33. Send to mentor.

34. Return MPL to original position by turning OFF, moving, and turning back ON (see above).

V. References:

1. Spinhirne, J.D., A.R. Rali and V.S. Scott, 1995: "compact Bye Safe Lidar Systems," Rev. of Laser Engineering (submitted)6p.
2. Gaffney, J. MPL Instrument Manual, 1995—MAN(MPL)-xxx.xxx

VI. Attachments:

1. CALC(MPL1)-0002, **ARCS Micro Pulse Lidar Overlap Calibration Check Form.**
2. CALC(MPL1)-0003, **ARCS Micro Pulse Lidar Overlap Calibration Check Form.**

Attachment 1

ARCS Micro Pulse Lidar Overlap Calibration Check Form

I. **Calibration information**

This is a (check which):

Calibration	Calibration Check	Field Calibration
	X	

Date:	GMT Begin Time:	GMT End Time:	ARCS #
04/29/98	8:00	9:00	1

Instrument / System:	TWP OMS Part Number(s):	TWP OMS Serial Number(s):
High resolution MPL	MPL 1000	
Low resolution MPL	MPL 1000-009	NASA-141503 (Property #)

Location (eg. PNNL, Manus):	Participant(s):	Issued by:	Signature(s):
Manus	W.Porch	W. Porch	
	D. Scott		

V. **Completed Steps**
Check the folowing steps
when completed

Overlap Test	x
Hard Target Test	
Lid ON, Laser ON	x
Lid ON, Laser OFF	
Date Data Transfer to	4/30/1998

Mentor

Document(s) Referenced:

PRO(MPL)-015.002

Document(s) Updated:

Attachment 2

ARCS Micro Pulse Lidar Overlap Calibration Check Form

I. Calibration information

This is a (check which):

Calibration	Calibration Check	Field Calibration
	X	

Date:	GMT Begin Time:	GMT End Time:	ARCS #
04/30/98	4:00	5:00	1

Instrument / System:	TWP OMS Part Number(s):	TWP OMS Serial Number(s):
High resolution MPL	MPL 1000	
Low resolution MPL	MPL 1000-009	NASA-141503 (Property #)

Location (eg. PNNL, Manus):	Participant(s):	Issued by:	Signature(s):
Manus	W.Porch	W. Porch	
	D. Scott		

V. Completed Steps
Check the folowing steps when completed

Overlap Test	x
Hard Target Test	
Lid ON, Laser ON	x
Lid ON, Laser OFF	x

Date Data Transfer to Mentor   4/30/1998

Document(s) Referenced: Document(s) Updated:

PRO(MPL)-015.002